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ABOVE—Atlantic Street, Stamford, Conn., Constructed with "Tarvia X" in 1918.
AT LEFT—West Broad Street, Stamford, Conn., in Front of Hospital. Maintained with "Tarvia B."

How Stamford's streets are maintained at low cost with Tarvia —

With many miles of waterbound macadam streets, Stamford, Conn., had considerable of a problem in its road maintenance. How Stamford maintains these streets at low cost is told by Mr. Paul Nash, City Engineer, in a letter:

"About ten years ago the City of Stamford first used 'Tarvia-B' experimentally as a road preservative, and each and every year since that time has depended mainly upon this material for keeping its streets in serviceable condition.

"We have at this time about thirty miles of water-bound macadam roads which are treated annually with one application of 'Tarvia-B' (some needing attention

every other year only) using about 60,000 gallons of 'B' or about 2,000 gallons per mile, at a cost of from four to six cents per square yard.

"The condition of these roads at all times of the year is satisfactory and they can all be classed as good roads."

Salvaging old streets with "Tarvia-X"

Stamford also uses the "Tarvia-X" penetrator method of resurfacing old macadam roads that are past treating. Mr. Nash's letter goes on to say:

"Our oldest road of this type, now six years in service, is apparently in as good condition and as smooth as when built."

Mr. Nash concludes his letter by saying:

"I want to say a word in commendation of your 'KP' patching material. We could not do without it."

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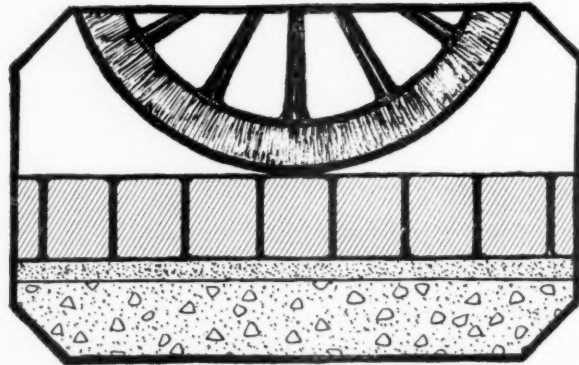
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NEW YORK, APRIL 10, 1920



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A Combination of "MUNICIPAL JOURNAL AND PUBLIC WORKS" and "CONTRACTING"

Vol. 48

NEW YORK, APRIL 10, 1920

No. 13

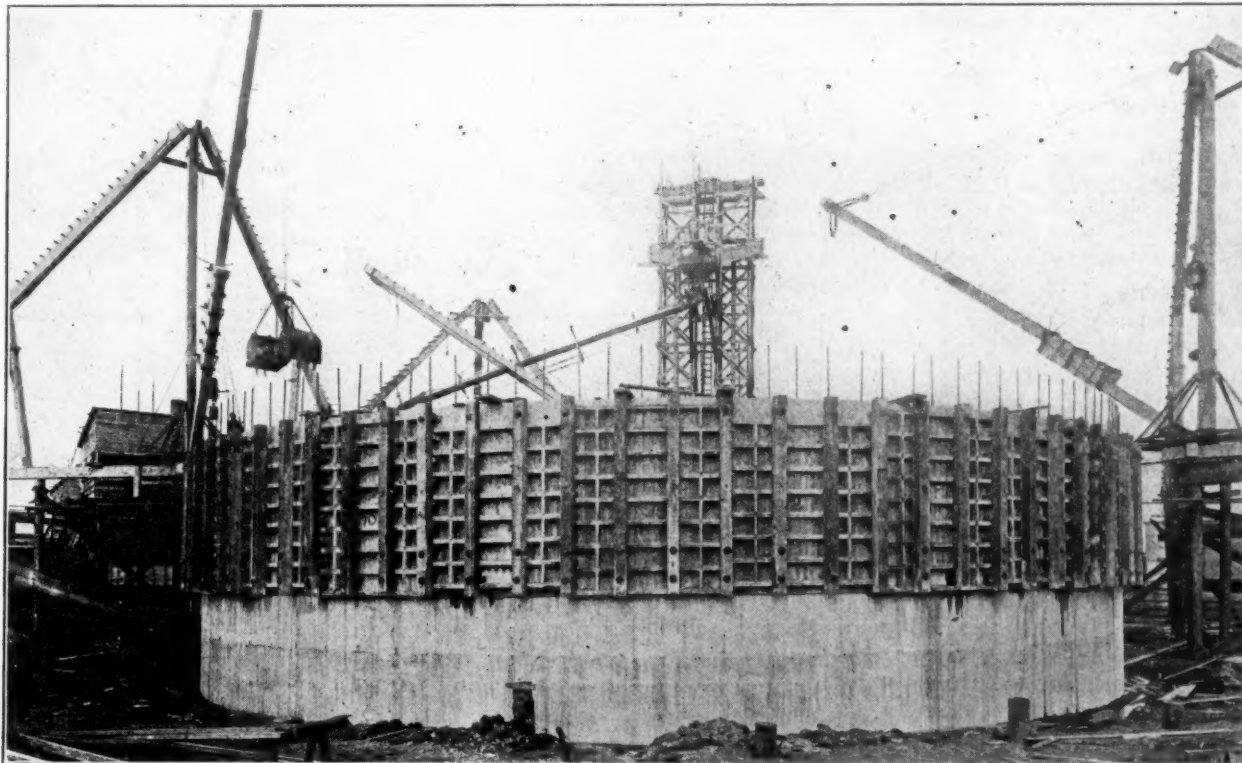
Bridgeport Sewage Disposal*

An intercepting system collects the discharge from 59 sewers previously emptying into tidal creeks and the harbor. The sewage will be delivered to a well below tide level, at the bottom of which it will be screened, the solid matter delivered by a pneumatic conveyor system to a storage hopper elevated above the street that discharges into tank wagons in which it will be hauled to the town farms and buried. The liquid effluent will be pumped to the force main by a battery of centrifugal pumps with an ultimate capacity to handle the sewage from a population of 180,000, or a total dry weather flow of 35,000,000 gallons daily.

Previous to 1906, the city of Bridgeport, Conn., was served by a combined system of sewers, many of them too small, and all emptying into the nearest

* Abstract of paper presented to the Connecticut Society of Civil Engineers, by James A. McElroy, city engineer, Bridgeport.

tide water, where they had 59 outlets in the Pequonnock river, which divides the city into the eastern and western sewage districts and into several creeks and a pond. Large areas of the city near Long Island Sound have such a low elevation that it is



EXTERIOR OF CAISSON WHILE BEING CONSTRUCTED AND SUNK. FORMS AND REINFORCEMENT IN POSITION FOR INTERMEDIATE COURSE.



OUTLETS OF OLD SEWERS—SHOWN BY STARS.

impossible to collect the sewage and deliver it to outfalls or disposal works without pumping.

Thorough investigations were made by specialists who recommended two separate intercepting systems and pumping stations for a deep water outlet. In 1916, after the intercepting system had been completed as far as it would operate by gravity, the plans were reviewed, additional investigation made, and the original plans confirmed except that Imhoff tank treatment was recommended.

The Imhoff treatment in other cities was accordingly investigated and was found to be so uncertain and unsatisfactory, that it was rejected, and ultimately it was decided to dispose of the sewage by dilution preceded by clarification by fine screens, opportunities being provided for the future extension of the outfalls to permit of additional treatment if necessary.

This plan was adopted in accordance with the report of a committee consisting of the city engineer, the director of public works, the president of the paving and sewer commission, and the chairman of the committee on sewers of the common council. Their reports were approved by George W. Fuller and George A. Johnson and new plans were prepared for the western district pumping station including screening and pumping equipment to take care of the present sewage of the district with provision for the installation of an additional equipment when required in the future.

DISPOSAL WORKS.

Early in 1919, work was commenced on the combined treatment plant and pumping station for the western sewage district at the foot of Bostwick avenue on the water front, where there has been built an 84 x 66-foot rectangular one-story building over the concrete pump well 80 feet in inside diameter and 45 feet deep, which contains the screens, pumps, motors, grit basins, air compressor, pneumatic conveyor, and other elements of the installation. The plant which is designed for an ultimate capacity of 35,000,000 gallons per day at a future time when the ultimate population of the district may become 180,000, will be equipped at first for the treatment of about two-thirds of this

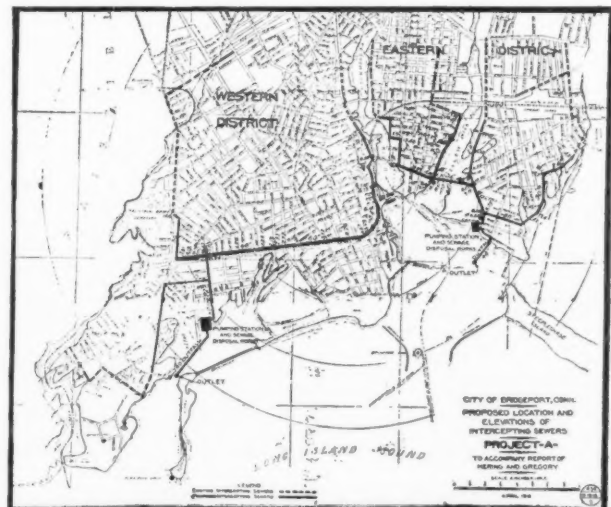
amount of sewage for a present population of 100,000; provisions being made for increasing the screening capacity 50 per cent when necessary.

A special feature of the design is the arrangement of pumps and screens so that the solid matter is removed at the foot of the deep well in the pump house, leaving only the liquid effluent to be lifted by the pumps. This arrangement was made to secure greater efficiency of the screens although the cost was somewhat greater than if the screens had been located at high level.

The flow line of the interceptor at the plant is 22 feet below the street level and 10 feet below mean low water. The sewage flows through a sluice gate and a bar screen and thence through a concrete channel to the R-W screen, the effluent thence passing over an adjustable weir to the sump whence it is pumped 25 feet to the force main by two 20-inch horizontal centrifugal pumps each with a capacity of 15,000,000 gallons per day, and two 15-inch horizontal centrifugal pumps with capacities of 8,000,000 gallons per day. The pumps will be direct connected to electric motors automatically controlled by floats in the sump.

The two screens at present installed have circular disks 22 feet in diameter, inclined at an angle 15 degrees to the horizontal and on them a concentrically mounted truncated cone 12 feet in diameter at the base. The surface of both disks and cone consists of a number of removable bronze plates perforated and set at such an elevation that about one-third of the disk is above the surface of the water. The screens revolve at a speed of about one revolution in two minutes and the solids retained on them are removed by revolving radial brushes that deliver them to the hopper of the pneumatic conveyor system that delivers to a storage tank 10 feet above street level, thus permitting the screenings to be dropped into tank wagons, carted to the town farm, and buried.

The sewage is measured by a venturi meter with automatic recording chart and register electrically operated. The building will contain a complete system of heating, ventilating and plumbing, including toilet and shower bath.



INTERCEPTING SEWERS.

Existing sewers shown by heavy dotted lines; proposed sewers by heavy full ones.

CONSTRUCTION OF PUMP WELL.

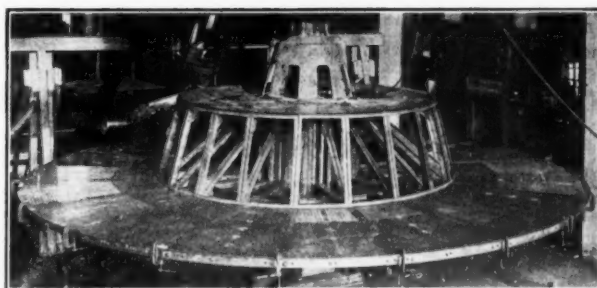
The reinforced concrete lining of the pump well is a thick cylindrical wall 80 feet in inside diameter and 45 feet deep that was built in successive 10-foot sections and, contrary to the predictions of engineers who believed it impossible to overcome the skin-friction, was readily sunk by interior excavation without even requiring additional loading.

The lowest ring, containing 475 yards of 1:2:4 concrete and 30 tons of reinforcement steel, had the interior surface flared outward to a cutting edge at the bottom, and was concreted in wooden forms with the interior and exterior walls connected by sectional horizontal tie rods spliced with sleeve nuts. The circular twisted steel reinforcement bars were wired to vertical and inclined twisted steel bars and were overlapped and wired together at splices.

After the first ring was stripped, it was sunk until the top was about one foot above the ground level, when the forms were reassembled on it and the second ring concreted, seasoned, sunk, and so on for the successive rings each of which contained 500 yards of concrete and 16 tons of steel, all being concreted in continuous 8-hour operations. The rings were commenced in March and finished June 1st.

The concrete was mixed in two 1-yard mixers located at the foot of a wooden tower in which the concrete was hoisted to a steel receiving hopper and thence spouted to the forms. The gravel and sand bins above the mixers were filled by a clam-shell bucket operated by a stiffleg derrick.

The earth inside the well was excavated at the rate of 200 yards per day by two $\frac{3}{4}$ -yard clam-

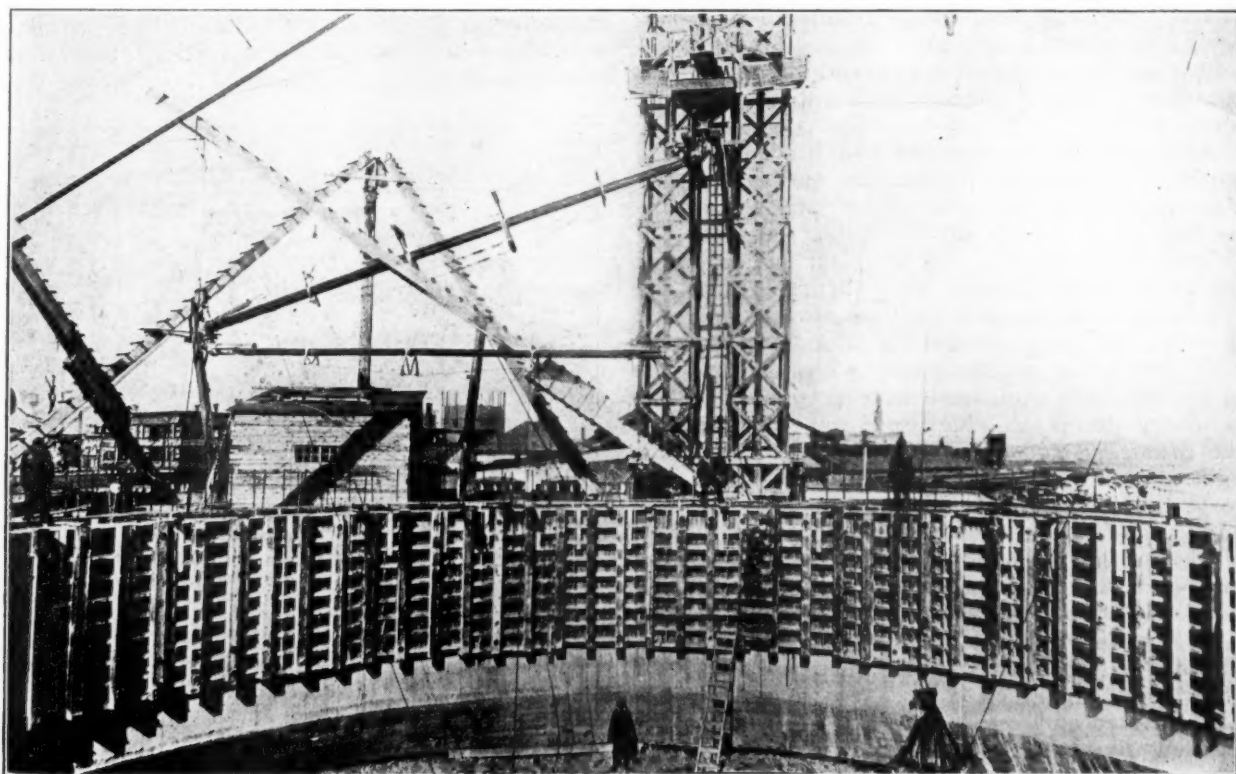


BRIDGEPORT SCREEN BEING ASSEMBLED.
Shows framework of "hat," etc.

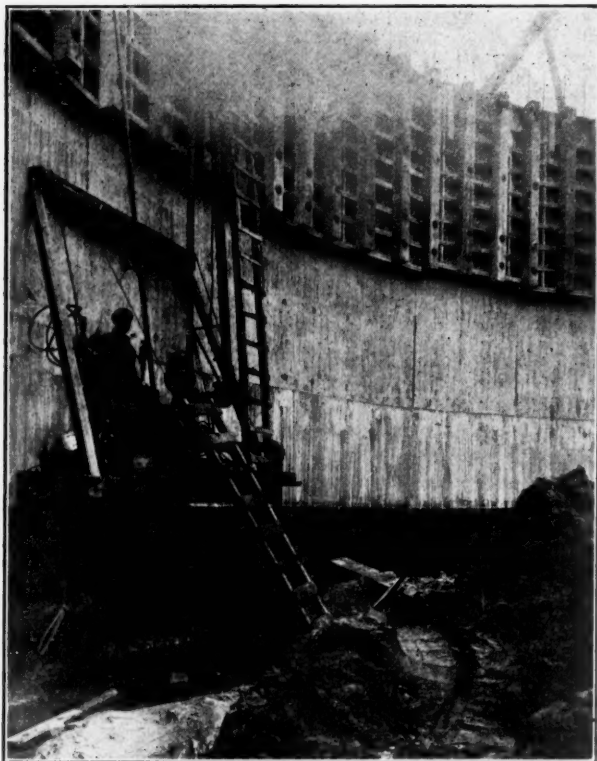
shell buckets operated by two 65-foot boom stiffleg derricks on opposite sides of the caisson.

As the caisson descended, frequent levels were taken and whenever it dropped out of plumb, excavation on the low side was temporarily discontinued while it was maintained on the high side until the caisson righted itself, never getting more than 9 inches out of level. Although it was not at first intended to keep the caisson dry during excavation, the amount of water entering it was found to be so small that it could easily be controlled and was therefore handled with pumps that kept the bottom dry at all times.

The caisson was sunk so easily that an attempt was made to excavate the last 3 feet of the depth below the cutting edge without sinking the caisson, but it resulted in pumping so much sand that the derricks and concrete tower were undermined. The top ring was then added to the caisson and the latter was allowed to fill with water and the remaining excavation was excavated under water until the caisson had sunk to the required depth.



INTERIOR VIEW OF CAISSON, SHOWING LOWER TWO COURSES. SPOUTING CONCRETE FROM HOISTING TOWER TO FORMS.



PUMP INSTALLED ON MOVABLE PLATFORM
BOLTED TO WALL

Soundings showed that the excavation was sufficient, and the bottom was covered with 1,800 yards of concrete placed under water in one continuous operation lasting 39 hours, the men being occasionally allowed to stop for refreshments but the mixers being kept in operation continuously, except when shut down for minor repairs. There was a 2-hour delay on the first day and the plant was shut down about 5 hours at different times during the second day.

After the bottom concrete had hardened for 3 weeks, the water was pumped out and as no leaks were found, the floor was finished and work commenced on the forms for the inside wall and partitions. It is expected that the plant will be put in operation about August 1st. The reports of the engineers and committees that investigated the problem and recommended its solution and a general description of the plant, with plans of the pump well and equipment were prepared by City Engineer James A. McElroy and published in the *Municipal Journal and Public Works* of May 24th and October 11th, 1919, pages 363 and 225, respectively, to which reference may be had for additional data.

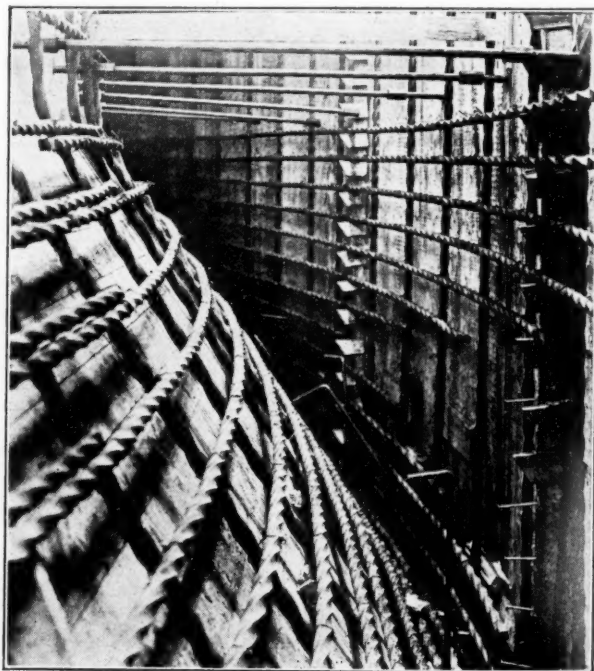
The locations, mentioned in the beginning of the article, of the 59 sewer outlets that originally polluted the rivers, creeks and harbor with sewage that is now treated at the disposal works are indicated on the accompanying map by stars that show how fully they covered the lower portions of the river and creek channels, insuring an increasing nuisance. The intercepting sewers that eliminated them are shown by heavy black lines on another map that also shows the division of the city and of the sewage system into eastern and

western district with the locations of their respective independent pumping stations and sewage disposal works. The intercepting sewers are from 24 to 66 inches in diameter and discharge to the pumping station through 66 and 72-inch mains with 48 and 60-inch outfalls to outlets in deep water where the effluent will be immediately diluted and carried away without, it is expected, causing any nuisance.

FORMS.

Both inside and outside forms for the circular wall of the pump well were made in wooden panels about 6 feet wide and 10 feet high with vertical lagging nailed to horizontal scarf boards about 2 feet apart in the clear made of pairs of boards with the inner face cut to the required curve and separated by vertical spacers. They were held in place by adjustable horizontal tie bolts screwed up against temporary radial spacing pieces. The ends passed through 6 x 6-inch vertical bearing pieces about 3 feet apart, every third piece engaging the ends of the scarf boards of two adjacent panels which overlapped each other, allowing the edges of the lagging to make a close butt joint under the vertical piece.

The forms for the first course of the wall were braced at every panel by pairs of inclined struts bolted to vertical piles driven in the ground. When the forms were stripped, both ends of the horizontal tension bolts were screwed out of the sleeve nuts and removed, leaving the main body of the bar permanently embedded in the concrete and permitting the forms to be readily detached. The forms were lifted vertically until the lower row of bolt holes engaged the upper row of bolt holes in the top of the concreted section of the wall and were connected to the permanent bolts in them, forming anchorages for the cantilever verticals that were bolted together with two tiers of bolts above the



INTERIOR OF FORM, SHOWING REINFORCEMENT
STEEL FOR CUTTING EDGE OF CAISSON.

top of the concreted ring, thus easily providing for the support and adjustment of the forms.

Both concrete mixers were installed at the bottom of a duplex wooden hoisting tower with an elevator bucket operated in each side that discharged the concrete into a large hopper with a gate through which it was delivered to long trussed sections of steel chutes connected with a swivel joint supported from a derrick boom and enabling the chute to command all parts of the wall.

The wooden derricks that handled the excavating buckets, sand, gravel, forms and other plant and materials were equipped with spliced booms 65 feet long, were swung by bull wheels, and were installed on pile towers about 20 feet high, located close to the circumference of the wall so as to enable

the boom to be operated flat and clear the tops of the forms.

Advantage was taken of the horizontal form rods embedded in the concrete wall to provide support for bracket platforms on which the steam pumps were installed for unwatering the caisson. These brackets had a timber framework with top and bottom horizontal sills provided with short bolts that were inserted in the holes in the wall and screwed into the sleeve nuts that were left there when the forms were stripped, thus giving very convenient and positive attachments that held the pumps securely without swinging or displacement. After the caisson was bottomed, the bolt holes on the inner surface of the wall were pointed with cement mortar.

Municipal Engineer's Records and Reports *

By H. F. Blomquist †

These records contain items which are necessary for informing the taxpayers what they have obtained or are to obtain for the money spent. Reports should omit details unessential to a general knowledge of the subject. Special reports should be given careful attention and be technically exact.

Nearly all of the construction and maintenance of the larger municipalities is done directly under its engineering department. The amount of money expended for such work is often the greater part of the revenue collected by such municipalities. The accounting and record keeping connected with this work is therefore of very great importance and merits much more consideration than is sometimes accorded it. It is not the purpose of this paper, however, to outline any definite system or scheme for such records, because any such attempt would be of little value since the organization and method of operation differs very largely even in municipalities of approximately the same size.

Also the work and organization of the engineering department of a large city is of necessity different from that of a small one. If a standard system of records were to be proposed, it would be necessary to include provisions for the activities of the largest unit of the particular division of the work and organization. While such a system might be very satisfactory for one organization, it would be far too elaborate for the greater number of municipalities and therefore not at all applicable to the average municipal engineers' organization. One of the purposes of any record is to furnish information regarding the operation, progress or results obtained from any particular activity, and in order to accomplish this, the form of records must be designed to meet the conditions peculiar to that particular activity, and in the simplest way that will give the information desired.

Municipal engineering consists of such a variety of work, and is done in so many ways that no complete classification of it can be made. Small cities most commonly suffer from a lack of co-ordination of the work done. Where it is not done with some definite plan in view for future extension of the same so as to make a complete whole, much work is often wasted later in changing and rebuilding. This is largely due to lack of systematic records and plans at the beginning. A large part of engineering work is purely research, and the value of such work is only preserved by the records and reports made of the same.

Among the values and purposes of records may be submitted the following: Historical; guide for future operations; basis for estimates; provide facilities for carrying on work; show efficiency of equipment, method or administration.

It is the intent of this paper to call attention to some general principles that affect the value of engineering records, and reports, and present a few suggestions on record keeping.

COST RECORDS.

Engineering records must of necessity include two separate elements of the enterprise, namely, the financial, or cost, and the material or results obtained. While the strictly accounting division of a municipal government must account for all revenues received, and assume the responsibility of collecting the same, also show in detail all disbursements and financial balances which give the status of the different departments of such municipality, it does not show the results obtained from

* Paper before the Minnesota Surveyors' and Engineers' Society.
† Prin. Asst. Engineer, St. Paul Water Dept.

certain expenditures, or in other words, the value received, and if such results are to be presented to the average citizen at all, or even to the executive officers of a municipal government, they must come from the engineer's records. If the voters are to obtain information as to what they will get for a certain bond issue, say, for water works improvements, or other municipal activities, they must get the same from the engineer's report. If anyone wants to find what it would cost to have the street paved in front of his premises, it must come from the engineer's office. If someone wishes to know the efficiency and general results obtained by the use of certain kinds of machinery or equipment, or method of operation as compared to that obtained from some other kind in municipal activity, the engineer must be able to furnish it, and so on. The accounting division of a municipality is not expected to give all this information, because much of it requires research work and technical calculations that must be done by engineers, but if accounts were kept with the purpose in view of furnishing all possible data for such information in addition to the balance sheet and other financial statements, the work of keeping the first element of engineering records, namely, cost accounts, would be greatly reduced.

While good financial accounting is an absolute necessity for municipal government, yet the engineering accounting or record keeping is of more interest, and of especial value to a municipality. The common financial statement does not often interest the average citizen, except in so far as it shows the amount of taxes he will have to pay the coming year.

I do not believe it is desirable, however, that the financial accounting should be changed so as to include all the engineers cost keeping, but it should be so modified or changed as to furnish certain information which is valuable and necessary for such cost accounting. Where the engineer's organization is not able to keep a complete system of cost accounts, a little additional work of the accountant would make it possible to so divide charges against improvements as to show at all times the cost of separate jobs of municipal work, also of separate items of the same job, and what part is permanent improvement or assets, and what part is maintenance or other charges. This can be simplified by attaching a blank distribution slip to all vouchers and pay rolls passed for payment, on which is marked the proper charges to be made. The engineer would make the distribution on these blanks when the nature of the work and proper method of distribution is not known to the accounting division. The extent to which such distribution is desirable will depend upon the organization of both the financial and engineering departments of the municipality.

In the smaller cities the city engineer's position may often be compared to that of the general superintendent of a corporation, and because of his acquaintance with the municipal business he can be of great help in outlining a proper system of accounting for the municipality. The accounting should in all cases be so complete as to furnish all

desirable financial details of the material progress of a city's activities, as well as the mere balance sheet feature. In this connection, as well as in many others, the engineer has not assumed the position he should logically hold in the administrative division of an enterprise.

ANNUAL REPORTS.

General municipal engineering reports are most commonly issued annually and should contain the results of the work for the period covered, together with other information of historical value, and for general information. Such reports prepared so as to form a link in a chain of records of the municipal work will become a history of the municipality's material progress, and are very valuable as such. The writer has found old annual reports of very great value many times in solving the problems of the city engineer's office, and in many instances they were the only source from which certain information could be obtained.

In order that the report may be of the most value, it should be very carefully prepared. It must, of course, consist largely of a summary of items from the records of the construction and improvement work done, but these can be presented in such manner as to give an interesting account of the material progress of the city together with frank statements of the existing conditions of the public property and utilities that come within the care of the engineering department, also suggestions as to desirable changes or improvements of the same.

A common weakness in reports is to detail unimportant things, and leave out the conclusions or results obtained and other important things. It is not important how much the street department paid to Tom Jones or Sam Smith in pay rolls during the past year, but it is important how much of the pay roll was spent for cleaning streets, paved and unpaved, and how much street cleaning cost per square yard, how much was spent for street sprinkling, how much for permanent work, such as building culverts, sidewalks, pavements, etc. Almost every good thing can be overdone, and reports are not to be excepted.

In making reports its purpose as well as the viewpoint of those to whom it is to be made should be kept in view. Too much detail work included in a report confuses the reader and often prevents him from grasping the valuable part of it. For example, it would be undesirable to include in the published annual report all the readings and detail description of a test for the efficiency of a steam or electrical pumping plant, or of measurements and data taken for determining the strength and condition of a bridge, but it is important to give a general description of such test or examination, and a clear statement of the results obtained. The detailed description and data connected with such work should be carefully included in a special report for the office files, and other necessary requirements.

SPECIAL REPORTS.

Much of the city work requires special reports, which cover for the most part purely research work.

Under such come estimates of costs, valuation, investigations of water supplies, type of systems or machinery, to be adapted for municipal utilities, tests of machinery and apparatus, and many others. All such special reports serve an entirely different purpose from the ordinary annual report or progress report, and should include in detail the measurements, observations, source of information and methods used in arriving at the conclusions. When such reports are completely worked out and include the information necessary to solve the problem at hand, other experts can easily review the same and the conclusions verified or proven incorrect with very little additional work.

The value of an engineer is often reflected in these special reports and here is where he has an opportunity to convince those connected with the problem that he holds the most important position connected with the proposed project.

INDEXING DATA.

The indexing of data is one of the most important factors in record keeping. A very valuable paper on this subject was presented by Mr. McKellip at a former meeting of this society. I have, therefore, not included it in this paper, but wish to state very emphatically that good record keeping is of little practical value unless a good and complete indexing system is kept of the same.

COST DATA.

Cost keeping may often be considered as a factor in the other forms of construction or progress records, whose purpose is to show the cost of the various items that enter into a particular job or structure. It deals both with materials and labor, and unless a simple and yet complete system is employed for gathering the required data, cost keeping may become very cumbersome. With a simple system regularly kept up, cost accounting may be done without confusion, but a lack of system will invariably result in an unreliable record, although it is often the result of much tedious work. Some instances have come to my observation where cost data is carried in minute detail beyond its practical value. The degree to which cost data should be carried will depend upon the demand and the practical value derived from it. Cost data furnishes valuable information for estimates in new work, and valuation of old work or utilities, and for analyzing methods of operation, and determining which are costly or economical to use. It should be left to the discretion of the engineer, after he considers the purpose and value of a particular cost account, to what extent the account should be subdivided.

STANDARDIZING FORMS FOR RECORDS.

Although municipal engineering work is carried on under different forms of organizations and the records are kept in different manner among the American cities, yet there are certain statistics and records that are common to all. I believe it would be desirable to have a committee work out a form of statistical report and when it has been put in the best practical form and approved, ask all mu-

nicipal engineers to use the same as a part of their reports. Valuable comparisons could then be made among various cities. Such report should contain data on all common features of the engineering work, such as amount of various kinds of pavements used in the city, amount laid during current year, average cost of each kind; number of miles of streets of each kind of street surface, cleaning and maintenance cost per unit of each; similar data on sewers and water works. Nearly all reports contain this information in one form or another, and a uniform method of reporting the same would be very desirable.

Triple Expansion vs. Centrifugal Pumps

The following letter was received a few days ago and submitted to Mr. Day for such comment as he might wish to make. He promptly replied, admitting the error in the calculation which Mr. Gibson points out. Mr. Gibson's letter is as follows:

Editor, Public Works, New York City.

Dear Sir:

The calculations by L. A. Day in your issue of January 24, comparing the respective costs of pumping in water-works service by triple expansion flywheel pumps, and steam-turbine-driven centrifugal pumps are of interest because of the presumably authoritative data therein presented regarding first costs, load factors, duties and operating expenses. The data appear, however, to lead to a conclusion quite contrary to that stated. That is, instead of the total cost per year of the triple pumps being lower than that of the centrifugal pumps of equal capacity, the centrifugal units have the best of it by a good margin at all points save one, namely, that for the 40,000,000 gal. per day unit with steam at the high price of fifty cents per thousand pounds, where the total charges for the two types of units come out nearly the same.

Mr. Day's error follows from a wrong method of calculating the fixed charges from the useful lives and first costs assumed for each of the two types of pumps respectively. Before proceeding to point out this error, the somewhat partial character of two of the assumptions upon which his calculations are based should be mentioned.

Mr. Day assumes that the reciprocating pump will last thirty-five years, and the centrifugal unit only twenty years, although the reason for this difference is not obvious, since the steam turbine-driven centrifugal pump is more simple and has fewer parts subject to wear than has the reciprocating pump, with its numerous water valves, steam valve gear, packings, plungers, pistons, cylinders, bearings, etc. He quotes a report of the Committee on Depreciation of the American Water Works Association, but the data used by that committee in reaching its conclusions were apparently so unsatisfactory that they have never been disclosed, and they should not, therefore, be given too much weight.

Mr. Day sets down the cost of foundations for a reciprocating triple expansion engine at \$1,000, as against \$3,000 for a turbine-driven centrifugal pump. This element of cost is extremely variable, according to individual conditions, but it certainly must be an exceptional case where the centrifugal unit, weighing one-twelfth or one-fifteenth as much as the reciprocating unit, and occupying only about one-tenth as much cubical space, requires foundations costing three times as much as for the latter.

Differences of opinion as to probable life and cost of foundations may, however, be left aside in view of the remarkable miscomputation introduced in the calculation of the fixed charge for the centrifugal unit. Take, for example, the 20,000,000 gal. units. The first

cost of the triple of this size is \$261,000, and the fixed charges are taken as 1.36 per cent for annuity, as required for an assumed life of thirty-five years, and 5 per cent for interest, or a total of 6.36 per cent, so that the annual fixed charge is \$16,600.

In calculating the annual fixed charge on the centrifugal unit, however, a new idea is introduced. As above mentioned, it is assumed that the centrifugal will last only twenty years, as against thirty-five years for the triple, and this is taken as a warrant for multiplying the \$70,000 cost of the centrifugal by the ratio of 35 to 20, or 1.75, to obtain an amount to which is added the \$3,000 for foundations, to make a total of \$126,000 upon which 3.36 per cent for annuity and 5 per cent for interest, or 8.36 per cent altogether, is levied, giving a total annual fixed charge of \$10,550.

Now a sinking fund is presumably to provide for replacement. According to the assumption, the centrifugal unit is worn out at the end of twenty years, but this annuity will by that time have accumulated to \$70,000, so that the new pump can be bought to replace it, just as at the end of thirty-five years the reciprocating unit will be worn out, but can be replaced from its sinking fund.

To put this in another way, at the end of thirty-five years we would have a worn-out triple engine and \$261,000 in the bank, while for the centrifugal we would, according to Mr. Day's method, have one worn-out unit, one three-quarters worn out, and an accumulation, due to the investment of 3.36 per cent of \$70,000 annually over a period of thirty-five years, of approximately \$323,000, assuming the annuity to be invested at 4 per cent, compound interest, as apparently assumed by Mr. Day, although not so stated in the article. In arriving at the \$323,000, it is also assumed that \$70,000 was not drawn from the sinking fund when the second centrifugal pump was purchased. If, however, this amount was drawn from the sinking fund at that time, why is it necessary to multiply \$70,000 by 1.75 in obtaining the amount upon which annual charges are figured for the centrifugal pump?

Again, the annual fixed charges of 8.36 per cent made by Mr. Day against the centrifugal unit, consist, as already mentioned, of 3.36 per cent for sinking fund and 5 per cent for interest. Mr. Day first multiplies \$70,000 by 1.75, then adds the \$3,000 for foundation, and then multiplies the sum \$126,000 by 8.36 per cent to obtain the annual fixed charge of \$10,550. What right has he to charge 5 per cent interest on three-quarters of the cost for the second pump all through the twenty years before that pump is actually purchased?

It really comes down to this: Accepting the life of twenty years for the centrifugal pump, the amount upon which the annual charge of 8.36 per cent is to be made is just \$70,000, or the cost of the unit. The annual charge to be made against the \$3,000 for foundations depends upon how long they are supposed to last. Mr. Day assumes, apparently, that they will last thirty-five years. If so, the annual charge for sinking fund against the foundations should be only 1.36 per cent, with 5 per cent for interest. Neglecting this point, however, and assuming \$73,000 is the amount which will have to be invested when a new pump is required, Mr. Day's table of fixed charges should read as follows:

FIRST COSTS.			
	Triple	Centrifugal	
20 m.g.d.	\$261,000	\$73,000	
30 m.g.d.	292,000	85,000	
40 m.g.d.	306,000	103,000	
ANNUAL FIXED CHARGES.			
	Triple	Centrifugal 20 Yr. Life	Centrifugal 35 Yr. Life
20 m.g.d.	\$16,600	\$6,100	\$4,650
30 m.g.d.	18,600	7,100	5,400
40 m.g.d.	19,500	8,630	6,550

The last column, based on the assumption that the centrifugal pump will last as long as the triple—that is, for thirty-five years—has been added. Summarizing, we have the following total costs, using the costs

for steam, repairs and maintenance as given in Mr. Day's calculations:

SUMMARY.

	50 Ct. Steam	30 Ct. Steam
20 m.g.d.		
Triple	\$38,100	\$29,800
Centrifugal 20 yr.	35,150	23,650
Centrifugal 35 yr.	33,700	22,200
30 m.g.d.		
Triple	50,000	37,800
Centrifugal 20 yr.	49,000	32,400
Centrifugal 35 yr.	47,300	30,700
40 m.g.d.		
Triple	59,800	44,000
Centrifugal 20 yr.	60,380	39,780
Centrifugal 35 yr.	58,300	37,700

Very truly yours,
GEORGE H. GIBSON.

Rahway River Draw-bridge Moved

400-ton structure lifted 32 inches by hydraulic jacks, placed on 50-ton trucks on falsework tracks and hauled 50 feet by tackles and hoisting engines and a crew of 50 men.

The reconstruction of a bridge across the Rahway river on the Perth Amboy branch of the Central Railway of New Jersey at a point about 1½ miles from Rahway required traffic to be by-passed which was accomplished by shifting the old double track drawbridge about 50 feet transversely where it was installed on a temporary wooden pier and connected with the main line tracks at both ends of the old structure.

The old drawbridge, weighing about 400 tons, was a plate girder structure with a span of 146 feet and a girder depth of 8 feet. It was shifted from old to new position, Sunday, Oct. 26, by a total crew of about 50 men, under direction of J. J. Yates, principal assistant engineer.

Although the bridge was over a stream where the tide rises and falls several feet, it was not practicable to lift and lower and transport it by water because the depth of the river is so shallow at the site that portions of the bottom under the bridge are exposed at low tide and pontoons could not be used without excessive cost for dredging. It was therefore shifted to new position by rolling transversely, a method which took longer and cost as much or more than floating would have done had it been available.

Four lines of trestle falsework were constructed from the old to the new position of the bridge, making an angle of about 80 degrees with the axis of the bridge, and on each of them were installed, one under each truss, two standard 50-ton car trucks connected by a long 12 x 16-inch timber reach.

The pivot, turntable wheels, and other center pier apparatus were securely attached to the bridge floor or trusses and the bridge was lifted about 32 inches by four 100-ton Watson-Stillman hydraulic jacks installed on the pivot pier, and by two 60-ton jacks on the abutment at each end.

The pivot pier jacks were located inside the drum where there was very little clearance with the radial struts and other members so that they were operated at great disadvantage. Although they had a nominal 12-inch stroke, it was found impossible to average more than about 6 inches lift for each setting of the jacks and the blocking, shifting and operation were so difficult that it required 3 hours to lift the span to a height of 32 inches, permitting the trucks to be moved under the trusses which were lowered to bearing on them.

The bridge was then moved forward to a position over the new pier by means of two four-part tackles operated by the hoisting engines on two floating pile drivers and by men with pinch bars which as the event showed would have been handled without the use of the tackles. Only about 5 minutes was required for the actual movement of the span to a position within 2 inches of the required center location of the pivot that was lowered to engage the old fashioned base plate with a clearance of $\frac{1}{4}$ inch or less but was not provided with any pilot or guiding devices. It was therefore found necessary to lower the bridge almost to the required position, raise it, shift it, lower it again and so on until at last the pivot engaged the bed plate after about 3 hours' effort.

The experience gained in this work demonstrates that considerable time was lost on account of the unfavorable position of the pivot pier jacks inside the turntable. It was therefore decided on future occasions when similar operations were to be undertaken that it would be better policy to incur the additional expense of providing seats for the four pivot pier jacks outside the turntable and thus allow them to be operated with much greater rapidity and efficiency which will, it is expected, enable a similar bridge to be shifted and traffic resumed within a period of 3 hours.

Resurfacing Pavements in Several Cities

During the year 1919 the city of Lawrence, Mass., removed 6,110 square yards of sheet asphalt that had seen about twenty years' service, and replaced it with "Warrenite." After removing the old asphalt, some repairs were made to the concrete base, bituminous binder was laid, followed by the Warrenite surface. Granite blocks were laid as stretchers along each side of each rail of the street railway. These blocks were furnished by the city and delivered on the work without cost to the contractor.

The contract prices for this work were: Removing old asphalt and cleaning concrete base, 30 cents per square yard. Extra concrete for repairing base, \$9.95 per cubic yard. Bituminous binder laid in place, \$7.60 per net ton. Wearing surface laid in place, \$1.93 per square yard. Laying granite blocks as stretchers, \$1.93 per square yard.

Some old wood block pavement in Indianola, Ind., which had been carrying business traffic for seven years was resurfaced last year by sweeping clean and applying tarvia B (warm but not hot)

and covering this with a heavy layer of sand. This work was done by the regular city gang under the supervision of A. H. Gilliland, city engineer.

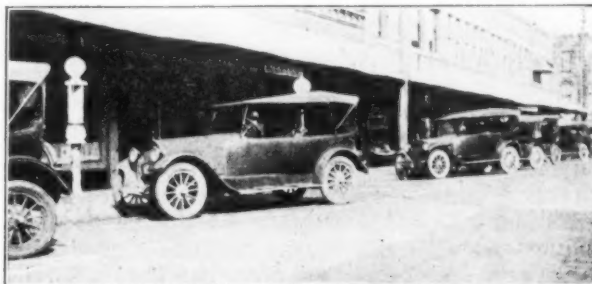
Bids were asked last year by North Tonawanda, N. Y., for resurfacing water-bound macadam with tar macadam, using slag, crushed stone screenings and tarvia. As the bids ran about \$11,000, the city decided to do the work with its own forces, and completed it at a total cost of less than \$5,000.

The old surface was thoroughly scarified; crusher run slag was used for the bottom 4 inches and graded slag for a second course $2\frac{1}{2}$ inches thick and screenings for a binder. Tarvia was applied to the surface at the rate of $\frac{3}{4}$ gallon per square yard and covered with screenings. Another application of Tarvia was made at the rate of $\frac{1}{8}$ gallon per square yard and this also covered with screenings.

Parking Automobiles in Palatka

Most of the smaller cities in Florida find that the construction of good roads during the past five years or so has so increased the use of automobiles, both those owned by the residents of the state and those belonging to tourists, that the problem of parking automobiles in the streets of the city has become a very serious one.

Several of the Florida cities have adopted the plan of indicating parking spaces by white lines painted on the brick or asphalt streets (which are common in the business centers). This idea is carried out quite completely by the city of Palatka. In the five or six blocks which constitute the business center of this city and which are paved with brick, parking spaces are indicated by white lines painted on the pavement running at an angle of about 45 degrees from the curb to another line parallel to the curb and a sufficient distance from it to permit parking between the curb and this line automobiles of ordinary length; the diagonal lines being a safe distance apart to provide abundant space for parking any width of truck between them. There is a city ordinance requiring automobiles to park at an angle with the curb, which method of parking permits any automobile to back into the free roadway without interference from or with the others parked next to it. This painting of the diagonal lines not only aids in this, but suggests to the forgetful, or to strangers who are



PARKING AUTOMOBILES, PALATKA.

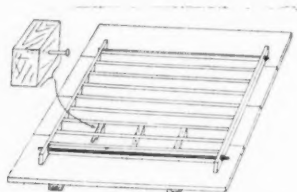
The longitudinal and diagonal lines painted on the pavement can be seen faintly.

ignorant of the ordinance, that parking in this way is required.

For painting these lines several kinds of paint have been used, but we could not learn that any one kind had given decidedly better satisfaction than others. The painting of the lines has to be renewed every three to five months. In painting the lines, one side of a street for the length of one block is roped off for twenty-four hours, during which time the lines are painted and the paint allowed to dry. The photograph shows a short stretch of a Palatka street where these lines have been provided and where most of the parking spaces are occupied.

Homemade Concrete Form Spacers

The Contractors' Atlas illustrates a very useful and inexpensive concrete form spacer that is very convenient to have in stock and may easily be made on the job in odd moments. It consists essentially of a small concrete strut to use inside a form and separate the walls, that can be left permanently in position. It is 6 inches long, made with 1:1 Portland cement mortar and cured for at least two weeks. A nail embedded in one end provides for its convenient attachment to wooden forms. Care should always be taken when using it in a horizontal position to set it with one of the cross section diagonals vertical.



These spaces can be cheaply and rapidly made in the collapsible form here shown that consists essentially of a wooden gridiron held together by two bolts through the end pieces, and supported on any convenient smooth platform or board. The bars of the gridiron are spaced far enough apart to give the required width for the spacers and are separated by filler blocks set as far apart as the required length of the spacer. Each filler block has drilled through the center a hole large enough to receive a wire nail inserted part way, so as to become embedded in the concrete and remain there when the filler block is removed. The mould is filled with mortar mixed dry and well rammed which should be allowed to set several hours before the mould is stripped.

New York Surface Railroads in Bad Condition

The street surface railroad lines in New York City need more than \$6,500,000 to put their lines, cars and other equipment in first class operating condition. That the surface lines have deferred maintenance charges to the amount named, was stated at a recent hearing before the Public Service Commission for the First District, by R. H. Nexsen, electrical and equipment engineer. In some instances the deferred maintenance charge covers pav-

ing along the right-of-way, which some of the roads in receivership have frankly stated their inability to repair. Paving repairs are being made by the city, and the cost charged against the companies, to be later liquidated. In some cases the testimony showed that the cars of several companies need repairs to the extent of from \$500 to \$1,000 each. Cars, tracks and equipment generally, it was however stated, are at the present time in safe operating condition, but if repairs are much longer neglected the margin of safety will be decreased.

Highway Notes

Thomas H. McDonald, chief of the bureau of public roads of the United States Department of Agriculture, says that the bureau of public roads in its expenditure of Federal Aid funds is endeavoring to confine itself to two types of highways, namely, the low cost road involving primary work where the traffic is such that it can be carried on a sand and clay, gravel, or earth road or the high type road of a durable nature which would stand up under the heaviest traffic.

Roy D. Chapin, former chairman of the Highway Transport Committee of the Council of National Defense is quoted as saying that a survey conducted under the direction of the commissioner of education at Washington shows that 115 of the 127 technical schools are now giving courses of one kind or another in highway engineering.

Whether automobiles promote the improvement of highways, or good highways increase the number of automobiles, both of which are probably true, the fact remains that the number of automobiles in California last year increased 40.2 per cent., making that state the leader in the number owned in any state.

The transcontinental Lincoln Highway crosses eleven states that have already expended on or provided for it, during 1919, about \$12,000,000, bringing the total expenditures since it was commenced in 1914, up to about \$22,362,000. The 377.33 miles of new road built in 1919 included about 121 miles of concrete, 69 miles of gravel, 29 miles of macadam, 18 miles of bituminous macadam, 21 miles of brick and 117 miles of permanent earth grade and a little shale.

City Managers for Two Cities

East Radford, Va., has decided, by a vote of 358 to 241, for a City Manager form of government. An election will be held in June for the selection of three commissioners who in turn will elect a city manager, after they take office on the first of September.

West Liberty, Iowa, has voted through its councilmen to put practically all of the city's activities under the direction of a city manager at an annual salary of \$2,000. The first incumbent will probably be former Mayor C. J. Mackey.

PUBLIC WORKS.

Published Weekly at
243 West 39th Street, New York, N. Y.
by
Municipal Journal and Engineer, Inc.

Subscription Rates

United States and Possessions, Mexico and Cuba....\$3.00 per year
All other countries\$4.00 per year
Entered as second-class matter January 3, 1906, at the Post Office
at New York, N. Y., under the Act of Congress of March 3, 1879.

Change of Address

Subscribers are requested to notify us promptly of change of address, giving both old and new addresses.

Telephone (New York): Bryant 9591
Western Office: Monadnock Block, Chicago

A. PRESCOTT FOLWELL, Editor
FRANK W. SKINNER, Associate Editor

Up-to-Date Sewerage Work

The construction, now well advanced, of one unit of the sewage disposal plant for the city of Bridgeport is a piece of municipal engineering notable for the unusually thorough preliminary investigations, for the type of plant selected, and for the ability and practical success with which the work has been executed.

Years ago the city engineer foresaw the future necessity of eliminating the harbor pollution that is tolerated in so many towns and cities, and a thorough investigation was made by specialists who recommended the best system at that time available. Portions of this work, inseparable from any improved system, were immediately undertaken in the construction of intercepting lines, but before the disposal works were commenced the plans were reviewed, and it was believed that, in the light of later experience, the proposed treatment had proved unsatisfactory in other cities, and it was therefore decided to replace it by an entirely different method, fine screening, which was accordingly adopted.

The new plan, approved by the city engineer and other officers, and by experts, governed the design of the present pumping, screening and outfall works, which has been made with careful attention to safety, efficiency and economy, and includes important innovations, such as the location of the screen at the bottom of the pump well, improved method for handling the sludge without creating a nuisance, and a simple automatic control of the machinery.

The execution of the work involved serious uncertainties in the construction of a very large, deep well in difficult material below water level, where great difficulties were anticipated by outside engineers, and where the ordinary methods of constructing the substructure in a cofferdam would have involved great risks and large expense. The city engineer, after a careful study of conditions, did not hesitate to adopt a method frequently used for bridge piers and other important foundations, but seldom applied on so large a scale, which, with the character of the bottom, greatly increased the expectation of trouble. He adopted the dredged open caisson method, and successfully sunk a huge concrete shell under its own weight where it had been predicted that the skin friction would entirely prevent its descent to the required depth. The

usual difficulties from incoming water and undermining were easily overcome, excavation was advantageously effected and the bottom was successfully sealed, enabling the work to be carried on economically and safely. A first-class mixing and hoisting plant was installed and concrete spouted to place for the continuous filling of the forms, and ingenious features were provided for the details of the work. In this way results were obtained that were far cheaper than would have been secured by doing the work with the pneumatic caisson process, which is the one usually adopted under conditions of this nature.

Difficulties of Municipal Financing

The \$45,000,000 Hetch Hetchy water supply system for San Francisco, which is planned to bring from a long distance an abundant supply of pure mountain water adequate for domestic and manufacturing purposes for a long time, and at the same time to utilize the hydrostatic head for the operation of a hydro-electric plant that will conserve enough of the potential power to operate city utilities and produce a revenue of something like \$2,000,000 per year, is a great financial as well as a great engineering undertaking. About \$9,000,000 has already been expended on the preliminaries and on commencing construction as has been described in recent issues of PUBLIC WORKS and the supplementary railroad and hydro-electric development necessary for the main construction have already yielded a material revenue that will appreciably reduce the net cost of the enterprise.

Nevertheless the delay that must necessarily be caused by the slow driving of the 18-mile tunnel before the new water supply can reach the city, and the uncertainty of the exact cost, together with other reasons, make it difficult for the city just now to dispose advantageously of the \$15,000,000 bonds issued on account of the water supply. As their present market value is about 87 and the city charter prohibits their being sold below par, it has been proposed to evade the legal restrictions by an agreement with local banks by which the latter shall nominally purchase the bonds for cash at par, actually paying \$15,000,000, but immediately receiving a return payment of \$2,400,000 to cover the difference of \$1,875,000 between the market value and the par value and \$525,000 for the 3½ per cent commission demanded by the banks.

These operations will be conducted by a superintendent who will subsequently supervise to some extent the contracts for labor, materials and equipment, bills for which will be approved by the city engineer, audited and paid by the city treasurer. These bills will include an estimated amount of about \$10,000,000 for labor and material required to complete the mountain division in three years besides which \$750,000 more will be paid to the superintendent for his services.

As the superintendent's services are apparently supererogatory in that he does little more than duplicate the work necessarily done by the city engineer's office, it appears that if this plan is actually carried out, it will practically amount to spending \$3,150,000, or 21 per cent of the bond issue for the sole purpose of violating the clear provisions of

the city charter. It may well be that the charter does not properly provide for the present contingency and that it needs revision or that some other relief is necessary to carry out vital improvements on the large scale requisite; if so, it would be much cheaper and better to revise the charter and finance the work in a straightforward way which would cost less and look much better.

Co-Ordination of Public Work

The plan to have all United States construction work placed in charge of a federal department of public works headed by a cabinet member has received intermittent attention for many years, and has recently been more widely urged, giving it an impetus that, if continued and augmented, may bring success. It is, however, necessary to maintain a vigorous and increasing promotion of this important subject so that its inertia may be that of a great moving, rather than that of a fixed mass.

Fortunately there have been no serious objections to the plan demonstrated, while its advantages are numerous and obvious. About the only disadvantages apparent are the questionable ones of the elimination of a large number of superfluous employes, the prevention of unnecessary and expensive duplications and interfering work, political opposition, and the not unnatural objections of existing government bureaus and organizations that will be combined, subordinated, or dispensed with by the new system. We can feel some sympathy with the last named, but it is tempered with the knowledge that all of the efficient and loyal members of present organizations will be first eligible for equal or superior positions in the new regime.

The great advantages are too unmistakable to need complete enumeration, among them are the simplifications, economy, and standardization of great operations that necessarily involve billions of dollars of expenditure and under present conditions are often greatly delayed and complicated. It is the only way to place this great work on an up-to-date business standing, to encourage zeal and efficiency, to secure the best design and execution of the work, to keep abreast of progress in other countries, and to insure dignity and appreciation for the great construction interests on which the progress, safety and prosperity of this country depend.

The revision and co-ordination of all the resources and activities constantly employed by the government on the hundreds of millions of dollars worth of work annually executed will make for tremendous improvement in research, equipment and production, it will enable matters of the highest import to be undertaken that cannot be carried out by individuals nor by dislocated branches of a heterogeneous combination such as at present existing, and will provide information, equipment and organization accessible to the whole country, establishing standards of the first importance for the guidance and assistance of states and municipalities, thus saving vast quantities of public funds, expediting all kinds of important construction, and affording magnificent opportunities for individual effort in any direction for which the engineer, contractor, architect, designer, manufacturer and distributor are qualified.

The Proper Qualifications?

Engineering societies are almost universally notable for the high average of their personnel in individual attainments, technical ability, professional loyalty, standards and achievements, scrupulous ethics, and for progressive conservatism that makes for the best development.

Their membership includes a very high proportion of the best and ablest men in the profession and a low proportion of inferior engineers. Membership in the societies is the hall mark of professional standing, certifying to a satisfactory amount of preparation, qualifications, and actual successful experience. Election to the presidency is the highest mark of honor and dignity that can be bestowed upon a member by his associates, and is a supreme recognition of his professional abilities and of his qualifications to act as representative for the whole body with power and influence in its business, social and professional operations.

It is generally bestowed on members of ripe experience who are thoroughly grounded in all of the principal interests of the society and often distinguished for exceptional success or brilliancy in some of them, or for great fidelity to the profession. It is usual and fitting that they should be especially representative of the devotion which makes the profession the superlative interest of a lifetime and devotes increasing energy to it. The president should at least have the potential ability to engage in all the activities associated with the welfare of the society, with knowledge of their hardship, requirements, and general conditions, with broad-mindedness, personal appreciation, and sympathy. Without these qualifications he lacks the full measure of deserving the position, as well as complete ability to fill it perfectly.

Similar considerations prevail in most other clubs, societies and associations; their chief executive is supposed to be especially representative of the personnel, influence and dignity of the body. Even an extremely brilliant, wealthy, or amiable member is not eligible to that high office on this account alone, especially if he be conspicuously limited in qualifications, environment, or personality.

There is no overwhelming reason why a capable woman cannot make an excellent computer, a first-class draftsman, an office executive, or engage in important research work. Many have proved their ability in these directions. There are, however, strong reasons that have prevented them from desiring or accomplishing much in the field of construction, political and financial operations of magnitude, and the various responsible engineering positions that demand wide and intimate research and experience in difficult and tedious operations that involve great hardship and many long years of supreme effort. The very few that have attempted it are unlikely to change the established order or even to continue with the resolution and determination necessary for success in a life work.

After all has been said, however, each body has the undoubted privilege of choosing its own president, and this right has been exercised, as noted in the personal column of this issue, by a western society of engineers, which has elected a woman for its president.

Recent Legal Decisions

HIGHWAY BID NOT PERMITTED TO BE WITHDRAWN.

E. W. Foley Contracting Corporation vs. Green, State Commissioner of Highways, Supreme Court of New York, Special Term, Albany County, August, 1919, 177 N. Y. Supp., 779. On the morning of the day for opening bids for the completion of a county highway the contracting company, through its vice-president, filed in the office of the Highway Department a bid for \$118,205.50. At the time the vice-president had in his possession another prepared bid for \$123,357.70, which bid he desired to deposit, but he was informed that he could not deposit the larger bid unless he deposited therewith three per cent of the amount of the bid. He had with him only a certified check for \$3,600, which was sufficient to be submitted with the lesser of the two bids. Later the vice-president returned with \$120 in cash, which he enclosed with the bid for the larger sum with the following memorandum:

"This bid supersedes one formerly deposited for \$118,000, and check deposited with that bid applies to this one."

The other bids upon the contract being larger than the larger sum bid by the contracting company, the Highway Commissioner awarded the contract to the contracting company. The Attorney General rendered an opinion that after a bid or proposal for a highway contract had been deposited with the State Commissioner of Highways it could not be withdrawn, even with the consent of the Commission, unless an unintentional mistake had been made, for which a Court of Equity would grant relief.

The contracting company brought action, asking for a peremptory writ of mandamus requiring the Highway Commissioner to reject the first bid and to award the contract without considering it. The application was denied, the Court approving the opinion of the Attorney General, in which he said:

"Although in cases of private contracts a bidder can always withdraw its offer before its acceptance, a different rule prevails in the case of public contracts; the reason being that in public contracting all parties are operating under regulatory statutes and subject to the restrictions thereby imposed, and that, if bids were permitted to be withdrawn, the highest bidder might be made the lowest by the withdrawal of all other bids, thus producing fraud."

CONTRACTOR RESPONSIBLE FOR INJURY TO SUB-CONTRACTOR'S EMPLOYEE.

Cassin vs. Stillman, Delephanty-Ferris Company, 185 A. D. 63, Supreme Court, N. Y., Second Department, Appellate Division. The defendant was a general contractor for the construction of certain sheds at Weehawken, N. J., for the West Shore Railroad Company. Such contract embraced the roofing of the sheds, and a subcontract for such roofing was made with the H. W. Johns-Manville Company. The plaintiff was in

the employ of the subcontracting company and was injured by the breaking of a ladder owned by the defendant, which he was using to gain access to the roof. He recovered a judgment against the Stillman, Delephanty-Ferris Company. The Appellate Division reversed the judgment and ordered a new trial. The syllabus of the case is in part as follows:

"Where the plaintiff, an employee of a subcontractor engaged in roofing a building, was injured by the breaking of a ladder owned by the defendant, the main contractor, the duty of the latter to the plaintiff must arise, if at all, out of its contract with the plaintiff's employer.

"The contract between the defendant and the subcontractor, the plaintiff's employer, did not in express terms require the defendant to furnish ladders for the employees of the subcontractor, and the plaintiff sought to enlarge the provisions of the contract by proof of a custom that general contractors furnish roofing contractors with such means of access to the roof. The only proof on this issue was that subcontracting roofers were accustomed to use ladders which the contractor brought to the premises for its own use. Held, that the evidence was insufficient to establish a custom enlarging the contract between the defendant and the subcontractor.

"In order to justify a decision that parties to a written contract intended to obligate themselves to do something which cannot be found in the terms of the contract itself, the custom must be shown to be reasonable, uniform, well settled and either known to the parties when the contract was made, or so generally known as to raise a presumption that they had it in mind at the time.

"Where it appeared that a form of contract submitted to the defendant by the subcontractor, and which required the defendant to allow the free and reasonable use of such facilities as might be available for handling materials, was rejected by the agent of the defendant who had charge of subletting the contract, it was reversible error to refuse to allow said agent to testify that he informed the subcontractor that he would not accept the contract because it bound the defendant to allow free use of said facilities, etc."

POWER TO MAKE PUBLIC IMPROVEMENTS OR GRANT AID THEREFOR.

(Ky.) Resolution of trustees of town of sixth class ordering sidewalk to be reconstructed without prescribing specifications or grade, did not delegate authority to fix specifications to engineer, and hence defeat lien on abutting property, since specifications and grade were fixed by the general ordinance under which the work was ordered.—*Eisenschmidt v. Ader*, 215 S. W. 48.

The ordaining of the specifications and grade of sidewalk improvement in town of sixth class is a legislative matter for the board of trustees, the board having no power to delegate the authority.—

NEWS OF THE SOCIETIES

April 12-17.—UNITED STATES GOOD ROADS ASSOCIATION. Eighth Annual Convention, Hot Springs, Ark. Director-General, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

April 16-17.—BANKHEAD NATIONAL HIGHWAY ASSOCIATION. Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

April 27-29.—CHAMBER OF COMMERCE OF THE UNITED STATES. Eighth annual meeting, Atlantic City.

May 4-6.—NATIONAL FIRE PROTECTION ASSOCIATION. Chicago. Secretary, 87 Milk street, Boston.

May 10-11.—AMERICAN ASSOCIATION OF ENGINEERS. Sixth Annual Convention, St. Louis, Mo. Secretary, C. E. Drayer, 63 East Adams Street, Chicago.

May 13-14-15.—LEAGUE OF TEXAS MUNICIPALITIES. The eighth annual convention will be held at Dallas, Tex. Secretary-Treasurer, Frank M. Stewart, University of Texas, Austin, Texas.

May 18-21.—NATIONAL ELECTRIC LIGHT ASSOCIATION. Annual convention, Pasadena, Cal. Acting Secretary, S. A. Sewall, 29 West 39th Street, New York City.

June 21-25.—AMERICAN WATER WORKS ASSOCIATION. Annual meeting, Montreal, Canada. Secretary, John M. Diven, 153 West 71st Street, New York City.

June 22. JOINT COMMITTEE ON STANDARD SPECIFICATIONS FOR CONCRETE AND REINFORCED CONCRETE. Next meeting at Asbury Park. Secretary-treasurer, D. A. Abrams, Lewis Institute, Chicago.

June 22-25.—AMERICAN SOCIETY FOR TESTING MATERIALS. Asbury Park, N. J. Office of secretary, Philadelphia.

Aug. 30-Sept. 3.—AMERICAN PUBLIC HEALTH ASSOCIATION. San Francisco. Office of secretary, Boston.

Oct. 4-8.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, St. Louis, Mo. Secretary, Charles Carroll Brown, 404 Lincoln Avenue, Valparaiso, Ind.

American Association of State Highway Officials.

A conference of delegates from 20 different states was recently held in the offices of the Bureau of Public Roads, Department of Agriculture, Washington, D. C., to formulate a system of standardized tests for road materials. The delegates, together with officials from the Bureau of Public Roads, and engineers of state highway departments, made suggestions for the elimination of inconsistencies and the preparation of specifications that it is hoped will be voluntarily adopted by the different states and counties so as to provide for very wide uniformity in production and construction.

Association of Mississippi Valley State Highway Departments.

At the recent annual conference in Chicago, resolutions were passed protesting against the construction

of roads by the Federal Highway Department without state co-operation, and opposing propaganda of the American Automobile Association and others to lower motor vehicle fees regardless of financial conditions relating to highway improvements. Frank F. Rogers was elected president and Alexander Graham, Jefferson City, Mo., secretary.

American Concrete Institute.

There was a registration of 274 at the convention held at the Auditorium Hotel, Chicago, where among a large number of topics discussed and papers presented, there were included important ones on, Application of Water Ratio, Determining Volume-Weight of Aggregate, Standardization of Bar Sizes, Contractor's Plant, Sidewalks, Sewer Standards, Mixing, and Curing. The delayed recommendations of the Committee on Concrete Roads and Pavements will be published in the Institute's proceedings and the subject was discussed, among others by A. T. Goldbeck of the U. S. Bureau of Public Roads, who stated that investigations of the distribution of pressure on roadways, showed that stresses are small under static loads, even of heavy trucks, and that impact is the governing factor. For a fall of $\frac{1}{4}$ inch, the impact pressure may be almost three times as great as that due to the static loads and for a fall of 3 inches, this will become twice as much.

A joint session was held with the National Conference on concrete house construction. The officers elected were: President, H. C. Turner, New York City; vice-president, Charles R. Gow, Boston, Mass.; treasurer (re-elected), Robert W. Lesley, Philadelphia. Members of the Board of Direction: Edward A. Tucker, Boston; E. D. Boyer, New York; Arthur Bent, Los Angeles.

National Federation of Construction Industries.

There was an attendance of more than 300 at the first annual meeting at Hotel Sherman, Chicago. Gov. Allen of Kansas described the action taken in the recent famous coal strike and E. J. Russell, chairman of the National Board of Jurisdictional Awards, stated that a large proportion of the disputes brought before the board of three employees, three employers, one engineer and one architect, have been already settled, promising a stabilizing of the building industry and predicting that within five years, all disputes in the building trades that are now

settled by strikes will be settled without strikes.

A representative of the U. S. Department of Labor announced that the department favors a conciliatory attitude toward present problems of unrest, rather than precipitate action.

Among the important points brought out in the discussion of various topics were, that railroad service is more important than rates, the seriousness of the car shortage, the drift toward world trade, the necessity for foreign trade, opportunities in South America, the inability of railroads to perform their required tasks no matter under what control they are, the necessity of quantity productions and of standardization to prevent waste. The following officers were elected by the Board of Directors: President, Ernest T. Trigg, Philadelphia; vice-presidents from the twelve districts—(1) Boston, F. T. Miller, president, F. W. Dodge Co.; (2) New York, Dr. J. T. Duryea, Pierce-Butler-Pierce Mfg. Corp.; (3) Philadelphia, Col. John R. Wiggins, John R. Wiggins, Inc.; (4) Cleveland, John A. Kling, Kelley Island Lime & Transp. Co.; (5) Richmond, Gen. R. C. Marshall, Washington, D. C.; (6) Atlanta, Col. Sam Tate, Tate Mfg. Co.; (7) Chicago, B. F. Affleck, Universal Portland Cement Co.; (8) St. Louis, Geo. W. Simmons, Simmons Hardware Co.; (9) Minneapolis, L. S. Gillette, Plymouth Investment Co.; (10) Kansas City, Walter S. Dickey, W. S. Dickey Clay Products Co.; (11) Dallas, J. H. Kirby, National Lumber Mfrs. Assn.; (12) San Francisco, John Garland, National Association of Real Estate Boards; treasurer, A. M. Maddock, Thos. Maddock's Sons Co.; managing director, J. C. Frazee; executive secretary, Maj. John L. Clarkson.

There were elected directors from all parts of the country, each representing a different interest or industry, such, for example, as contracting, clay products, lumber, investments, construction, machinery, etc. Four of them were continuing directors elected for two years, and two for one year; nine directors for three years, four for two years, and six for one year.

National Crushed Stone Association.

The third annual convention was held at Louisville, Ky., Feb. 9, 10 and 11. Delegates were present from 18 states and from Canada and the construction and maintenance of roads and streets were discussed as an important feature of interest to the stone industry. John Rice, Philadelphia, was elected president; A. B. Sandles, Columbus, Ohio, was re-elected secretary.

New York Section American Society of Civil Engineers.

At the meeting of March 24, Senate Bill No. 1258, indicator No. 1104, now before the Legislature, was discussed in connection with the subject of licensing engineers in New York.

Brooklyn Engineers Club.

The regular informal meeting of April 1st was devoted to the discussion of License Legislation and Professional Restrictions.

Mississippi Waterways Association.

The St. Louis Chamber of Commerce has issued invitations to the governors of all the states in the Mississippi Valley and mayors of all the principal cities, together with all civic organizations of cities located on the Mississippi and its tributary rivers, to attend the third annual convention of the Mississippi Waterways Association, to be held in St. Louis on April 19 at Hotel Statler.

Resolutions will be passed which will impose on the leaders of both national political parties the vital and immediate demand for increased transportation facilities. These resolutions will be offered to the Republican and Democratic parties to be incorporated in their platforms when they meet in June.

The United States Good Roads, Bankhead Highway and Albert Pike Highway Association's Conventions.

Director General Rountree stated that there has never been a meeting of the organization that seemed to have aroused the preliminary interest as the one to be held here next month. An indication of that fact is seen in the acceptance of the invitation by C. E. Milliken, governor of Maine, who will appoint delegates to attend the convention with him.

All of the governors are doing that. Chief executives who cannot come owing to previous engagements, have written that interest has been aroused in their states over the convention and that they are naming men they know are interested in good roads and who will be at these meetings.

Letters of positive acceptance have been received from the following governors:

Le M. Russell, Mississippi; A. H. Roberts, Tennessee; W. P. Hobby, Texas; C. E. Milliken, Maine; Peter Norbeck, South Dakota; R. G. Pleasants, Louisiana; J. B. A. Robertson, Oklahoma, and O. A. Larazola, New Mexico. It is also understood that Arkansas' chief executive, Charles H. Brough, who will succeed the

late United States Senator Bankhead as presiding officer of the United States Good Roads Association, will also be at the convention.

A number of men who have been successful in promoting highway organizations in other states have been invited to deliver address. Among the number is Mr. A. F. Beaumont, secretary of the Lincoln National Highway.

L. G. Adams, president of the Alabama Automobile Dealers' Association, will attend and will appoint a delegation to represent the Alabama Automobile Dealers' Association at the coming convention.

Water Works Associations.

Committees appointed by the New England and by the American Water Works Associations are preparing a joint progress report including tentative specifications for water meters, on the basis outlined by meter manufacturers and expect to circulate their findings for consideration before the Montreal meeting of the American Association in June and the September meeting of the New England Association.

Illinois Drainage and River Improvement Association.

This association has recently been organized with 12 directors located in the principal river valleys as chairmen of their respective local committees. President, A. L. Maxwell, Lawrenceville, Ill.; secretary, G. W. Pickells, Urbana, Ill.

Engineering Institute of Canada.

The Toronto branch has passed a resolution calling on all branches to appoint committees to investigate and report on improving the economic status of the engineers.

United States Chamber of Commerce

The eighth annual meeting at Atlantic City, April 27-29, will be devoted entirely to the subject of increased production, with reference to governmental relations, to transportation, to internal finance, to agriculture and to labor.

North Dakota Society of Engineers.

At the 12th annual meeting, March 10th, there was an important discussion on roads and a committee was authorized to secure a revision of the state board of health rules requiring approval of all details in the design and construction of all water supply and sewage systems which have caused delay, friction and uncertainty of responsibilities. The formation of a federal department of labor was approved, and Esther M. Jack, city engineer of Williston, was elected president.

Joint Engineering Society Dinner.

Twelve prominent organizations gathered 300 strong March 30 in attendance at the eleventh annual engineers' dinner planned by the Boston section of the American Institute of Electrical Engineers, Boston Society of Civil Engineers and the Boston Section of the American Society of Mechanical Engineers. Participating with these organizations were the American Chemical Society, the American Institute of Mining and Metallurgy, the American Society of Civil Engineers, Engineers' Club of Boston, the Illuminating Engineering Society, the New England Water Works Association, Plant Engineers' Club, American Society of Heating and Ventilating Engineers and the Boston Society of Architects.

The principal speaker was Paul D. Cravath, New York, who was the legal representative in Europe of the United States Treasury Department during the war. He spoke on "Some Economic Aspects of the Treaty of Paris."

The toastmaster was Professor Dugald C. Jackson, of the Institute of Technology, and then chairman of the evening was Irving E. Moulthrop, assistant head of the construction bureau of the Edison Electric Illuminating Company in Boston.

The Pike's Peak Ocean-to-Ocean Highway Association.—At the annual meeting, Feb. 25, C. F. Adams, Chillicothe, O., was re-elected president; W. H. Goodin, Lovelock, Neb., vice-president, western division, and E. E. Johnson, Colorado Springs, secretary.

PERSONALS

Hansen, Paul, until now chief sanitary engineer of the Illinois Safe Dept. of Health has become a member of the firm of Pearce, Greeley & Hansen, Hydraulic and Sanitary Engrs., 39 W. Adams St., Chicago.

Pennartz, R. H., has been appointed resident engineer on Federal Aid road work in Shawnee County, Kans.

Barnett, Howard H., city engineer of Pontiac, Mich., has resigned to engage in the practice of consulting engineering.

Lenhart, L. I., has been appointed city engineer of Pontiac, Mich.

Rand, H. A., has been appointed road master of Clackamas Co., Oregon.

Compton, H. C., has been appointed district highway engineer at Boring, Ore.

New Appliances

Motor Cars on Rails, Illustrated.

The Palatine, Lake Zurich & Wauconda Railroad is using a 3-ton four wheel drive truck equipped with flanged wheels and passenger body on its 16-mile track from Wauconda to Palatine, Ill. The truck has a capacity of 80 passengers and hauls a 5-ton trailer loaded with freight and baggage. When not pulling a trailer the round trip of 32 miles is made on 6 gallons of gasoline. At one point on its route the truck climbs a seven per cent grade with full load. It is operated continuously from morning until night.

Thos. J. Lee, vice-president and

and 28 cubic foot bucket capacity with either boom and bucket or spout distribution, driven by steam or gasoline, and is efficient in continuous high speed operation, providing a very fast paving unit with a high yardage. These machines, bar cutters, bar benders, and other concrete equipment are manufactured by the Koehring Machine Company.

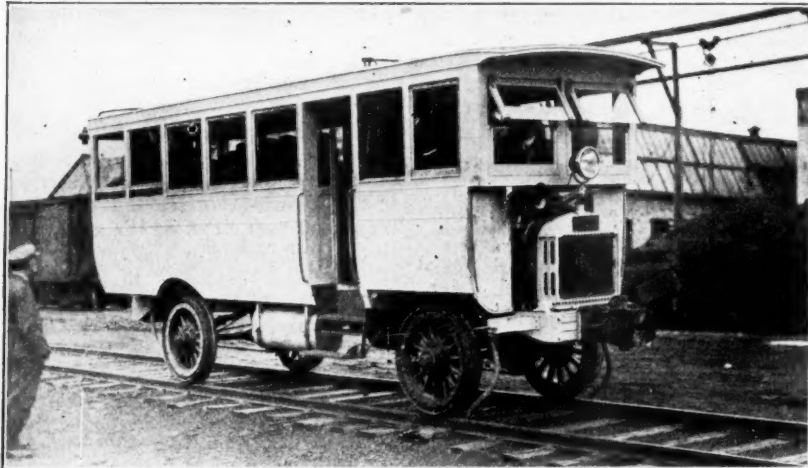
Safe Transport.

The "W. & T." Non-Spillable Shipping Container sold by Wallace & Tiernan Co., Inc., is applicable for transporting tubed media for the

The Dorr Company.

The Dorr Company, engineers, of 101 Park avenue, New York City, has recently arranged for the separation of its domestic sewage and trade waste from its industrial activities by organizing a Sanitary Engineering Department. All matters, including engineering service, pertaining to treatment of domestic sewage, waste waters of tanneries, glue, gelatine, milk products and corn products factories; cotton, silk and textile dyeing and finishing mills, canneries, brass, steel and rolling mills, paper mills, etc., are now being handled by the Sanitary Engineering Department.

Colonel I. L. Reeves, C. E., formerly president of Norwich University, and more recently president of the A. E. F. University, of France, has resigned from the army to accept the management of the department. Mr. C. Lee Peck, industrial engineer, continues in charge of the research and development work, while Mr. R. H. Eagles, also of the Dorr Company staff, will assume charge of the information and extension division.



MOTOR TRUCK ON P., L. Z. & W. RAILROAD.

general manager of the Palatine, Lake Zurich & Wauconda Railroad, said, "I think there is a great field for a truck which will operate successfully on a railroad, as there are about 250 short lines in this country which would be in need of them if the right car is built." The Butler County Railroad is reported to have also opened up a motor line from Fergus, Mo., to Tipperary, Ark.

bacterial analysis of water and sewage. For the shipment of tubes of lactose broth or bile for the presumptive colon bacillus test and the transportation of any sample where safe carriage is desired and continued vertical position essential, these containers are recommended.

INDUSTRIAL NEWS

Low Cost Shoveling.

A Thew Automatic Electric Shovel operated for nine months in 1917 and 1918 in a New York iron mine, handled about 13,000 tons of material at an average cost per ton of 16 1/10 cents. The ore was loaded into 3-ton cars which were hauled an average distance of 300 feet and the work performed was equivalent to hand labor that cost 30 cents per yard. Some of the mining shovels are made very simple and compact and can quickly be knocked down to pass through a 3-foot 6-inch x 3-foot 8-inch shaft.

Koehring Mixer Loaders and Mixers.

The loader is an independent loading unit for use where materials are placed on the subgrade. It is a simple installation of a belt conveyor in a light steel frame that is operated and moved from job to job under its own power. By accurately proportioning the aggregate, it insures uniform concrete, cuts out all wheeling, increases yardage and decreases costs.

The mixer is coordinated with the paver, comes in sizes of 10, 14, 21,

Sullivan Machinery Co.

This company has issued a number of bulletins illustrating and describing a great line of air compressors, angle-compound air compressors, portable gasoline driven air compressors, motor driven air compressors, compound Corliss air compressors, water hammer drills, valveless stoping drills, drill sharpeners, plug drills, and a utility hammer operated by compressed air or steam.

Mathieson Alkali Works, Inc.

Kienle, John A., formerly sales manager of the Electro Bleaching Gas Company, has been appointed general manager of sales of The Mathieson Alkali Works, Inc. This change was brought about by the severing of relations between The Mathieson Alkali Works, Inc. and its former sales agents, The Arnold, Hoffman & Co., Inc.

It is the intention of the Mathieson Alkali Works, Inc. to sell all of its products (caustic soda, soda ash, Virginia soda, bicarbonate of soda, bleaching powder, liquid chlorine, chlorine solvents, etc.) direct to the consumer instead of through sales agents.

Mr. Kienle has been placed in charge of the development of a complete sales organization.